DEXES

Deployable Exercise Support

for Civil Affairs, Peace-Keeping,
and Humanitarian Operations

User's Guide

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A project of
US Southern Command, SCJ5-PAS
Quarry Heights, Panamá

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1.1 Concept of the Game

The Deployable Exercise Support system (DEXES) is a simulation program designed to support bilingual international training exercises in military operations other than war for the U.S. Southern Command, Quarry Heights, Panamá.

This User's Guide is for personnel who are responsible for operating DEXES workstations. It describes how to understand and use the maps, icons, charts, and menus that are presented by DEXES. It also provides instructions for how to perform all of the actions that are commonly required of DEXES users. This User's Guide does *not* describe how to create a new exercise scenario.

At the heart of DEXES there is a dynamic mathematical model of society, encompassing economic, social, political, and public health variables. This model generates the societal reactions to actions taken (or not taken!) by the peacekeeping forces, hostile military and political players, and non-governmental organizations.

An analyst can set up DEXES for peacekeeping and humanitarian forces from many nations, under a single military command. Each force that has its own Area of Operations (AO) is a separate player in the game. Other players include the military command, the host nation's own government, up to four opposition guerrilla forces, military and civilian elements from neighboring nations, and non-governmental organizations (*e.g.* Red Cross, Care International, Doctors without Borders, *etc.*). DEXES is designed to be played by operators on a network of Macintosh computers. The computers are linked on an Ethernet network, so that every action or event that occurs on one computer is immediately reflected on all others.

Players that control units can perform actions at any time during the game. Each unit has a plan of action, consisting of a scheduled list of actions. The list of all permissable actions (and their consequences) is prepared during the setup phase of the game in the form of a spreadsheet.

Events in the game can be scripted in advance, by means of another spreadsheet which gives the event description, its day and time, and its consequences. Special non-scripted events may also be specified. These are events that are triggered whenever a specific combination of conditions is encountered. Triggered events are described in their own Excel spreadsheet.

As the game unfolds, scripted and triggered events occur, and operational units take actions in response. Each military, governmental, or non-governmental unit follows a plan that is constructed and maintained by the player who controls the unit. All events and actions have consequences that are expressed in terms of changes in the state vari-

ables of the societal model that underlies DEXES. The state variables are graphed in a chart window, which can be displayed or printed at any time.

The current list of societal state variables is divided into four categories: social, economic, political, and public opinion. There are additional state variables that describe the current state (supplies, efficiency, condition, etc) of each unit.

DEXES runs on Macintosh computers (including all Mac clones), or on Unix computers from Sun or Hewlett-Packard with the **Macintosh Application Environment** installed. Multi-computer operation requires Ethernet connections. Long-distance operation via the Internet is not yet supported.

1.2 Pre-start Checklist

Before starting a DEXES workstation in an exercise with networked DEXES nodes, verify each of the items in this checklist. The first item need only be checked once, all others should be checked every day before starting up. These items are all important for the smooth functioning of the program, and care must taken that unauthorized changes are not made while the program is off-line.

- ❑ System 7 is running (System 7.5 is preferred). To check, pick the menu item labeled **About This Macintosh** from the Apple menu.
- ❑ There is a physical connection to an Ethernet network. To check the connection type, open the control panel named either **AppleTalk** or **Network**, and verify that the type of connection is **Ethernet**.
- ❑ Program Linking is **ON** (use the **Sharing Setup** control panel).
- ❑ The monitor is set to **256 colors** (use the **Monitors** control panel).
- ❑ The correct printer has been chosen (use the **Chooser** for this).

1.3 Starting Up DEXES

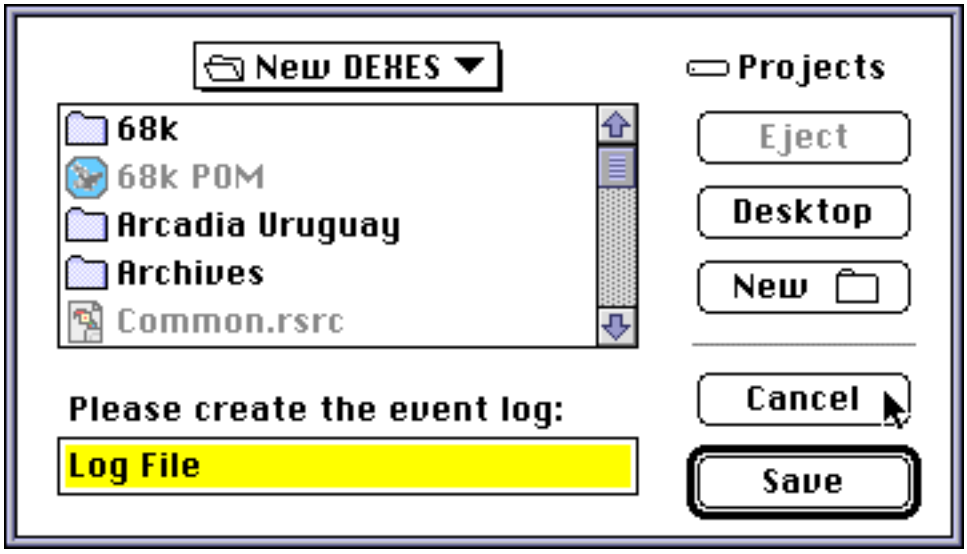
The folder containing DEXES must contain five items, as illustrated in the figure below:

The icon for the DEXES program is octagonal, with an eagle on a blue field. The icon for a saved game setup file has the same eagle on a blue field, but is rectangular with a dog-

eared corner, and bears the word SETUP. The two "jack-in-the-box" icons are resource files for the DEXES program. The scenario and maps for the saved game setup are stored a folder, which in the above example is labeled "El Sal Data".

To start DEXES, drag the setup file onto the program icon. Please **do not** attempt to start the program by double-clicking the setup file! This may not work as desired, because the computer's hard disk may contain many different versions of DEXES, and the wrong one may be launched by the operating system in response to a double-click.

After DEXES reads the map and scenario data files, it will display the following dialog:

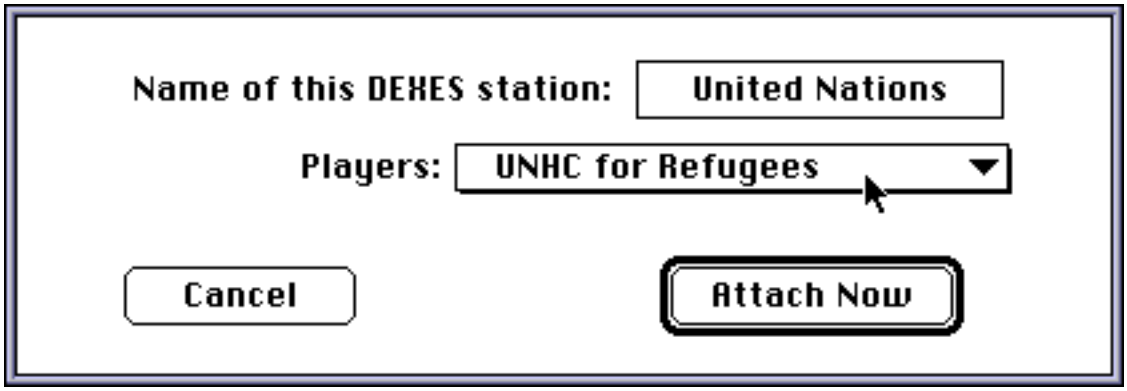


In general, you do not have to create an event log. If you click the **Cancel** button, then DEXES will not create any log files. If you click **Save**, then DEXES will make three log files: one log file in English ("Log File"), one in Spanish ("La Crónica"), and one data log ("Data History") in which values of all variables are stored, once per simulated day.

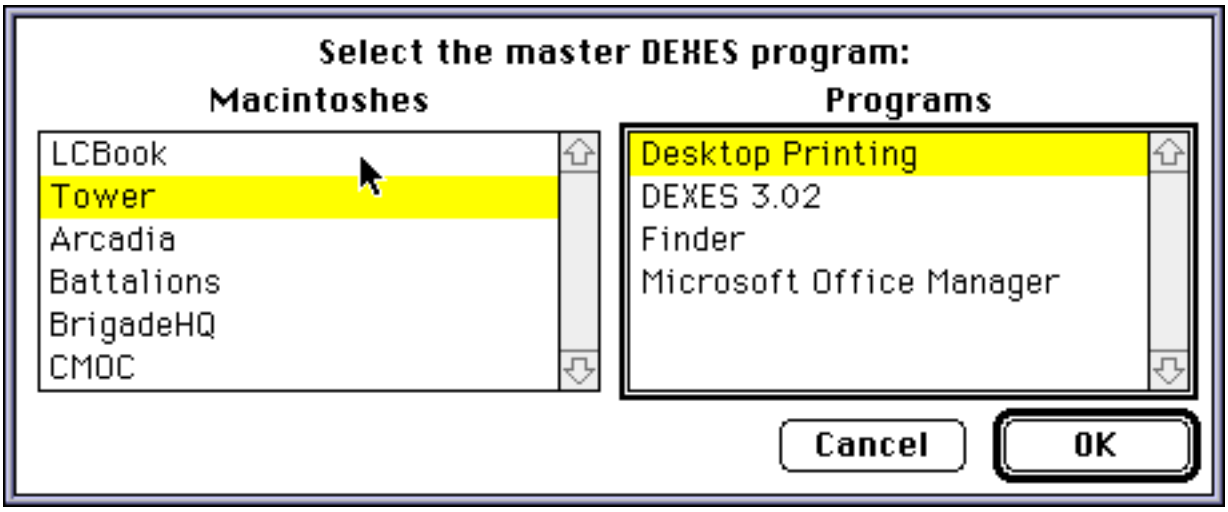
1.4 Attaching to the Network

After successfully starting DEXES on your workstation, the next task is to identify your workstation and the players who will use it to the DEXES master program, which is running on the administrative workstation in the Simulation Center.

To connect your DEXES workstation to the DEXES Master, pick the **Attach to**… item from the **File** menu. A dialog box will appear that asks for the name of this DEXES station. Enter the appropriate name, and then use the popup menu to select the names of **every** player that sits at this workstation. Then click **Attach Now**. In the example below, the name "United Nations" has been typed in for this workstation. The players that sit at this workstation have been selected with the popup "Players" menu, and the last player selected is still visible: the UN High Commissioner for Refugees.



When the next dialog box appears, as shown below, you will see on the left a list of Macintosh computers that are connected to the network, with your workstation highlighted. On the right you will see a list of programs currently running on your workstation (named, in this example, "Tower"). As you click the name of each Macintosh workstation in the left column, the list of programs running on that computer will be shown on the right.



The Master DEXES program, if it is currently running, will show up in the right column when you click on the name of the administrative computer on the left. Double-click the name "Master DEXES" when it appears in the program list on the right. Click **Okay**, and the game is ready to start. **Note:** the name of the administrative computer may change from day to day, depending on the needs of the exercise. Do not assume that the Master DEXES program will always be found on the same computer.

1.5 Map Tools

The map shown by DEXES is a background picture (usually digitized from a DoD map), with icons for cities, displaced person camps, military units, governmental units, and non-governmental units. A tool palette for selecting and manipulating these icons appears as a little window that floats above the map. To choose one of these tools,

simply click on its icon in the tool palette. The mouse pointer will change to resemble the chosen tool. The location of the mouse, in UTM (Universal Transverse Mercator) co-ordinates, appears in the lower half of this tool palette.

There are six tools in this palette. From left to right, these are as follows:

1. **The Standard Selector** 

   This tool is the ordinary Macintosh mouse cursor. It can be used to select units (but not areas or cities), and to perform normal Macintosh functions.

2. **The Magnifying Glass** 

   Use this tool to zoom in on the map. Simply click with this tool on the point around which you want to see more detail. When the detailed map is in view, use this tool to zoom back out to the overview map.

3. **The Unit Tool** 

   Use this tool to select a unit, by clicking on the lower left corner of its icon. When the unit has been selected, its icon will be surrounded with a dark rounded rectangle, and its planned movements (if any) will be shown. The illustration below shows what this looks like after a battalion HQ has been selected. This HQ unit has three movements in its plan. The unit selector tool is currently pointing at the second of these movements.

   The actual position of a unit coincides with the lower left corner of its icon. In the case of a headquarters unit, indicated by an icon with a flag pole,

the position of the unit is the base of the flag pole. The unit selector tool is also used to relocate a movement node, by dragging the movement node to its new desired location. To open a unit or movement node, double-click the unit or node with this tool.

4. The Movement Tool 

Use this tool to create a new movement for a unit. First, select the unit by clicking its location (the lower left corner of its icon). The movements in its current plan, if any, will be shown. To add a new movement onto the end of its planned sequence of moves, click on the last movement node and drag the mouse to the endpoint of the move. To insert a move between two existing moves, click on the line segment that joins two nodes, then drag the mouse to the location of the new movement node. *Note: you can also insert movements directly into a unit's plan, using the unit dialog.*

5. The Area Tool 

The scenario designers may have divided the map of the country into Areas of Operation (AOs) for the units that participate in the military component of the operation. To see these areas, select the Area tool from the tool palette. Click anywhere inside an AO with the area tool to select the AO. Double-click to open the AO. To hide the Areas of Operation, use the keyboard shortcut ⌘**A**, or, equivalently, pick the **Areas** item from the **Display** menu.

6. The City Tool 

Use this tool to select or open a city or displaced person camp. Click to select, double-click to open. Cities are shown as yellow circles, and camps are shown as yellow squares. The size of the yellow circle or square is related to the population of the city or camp.

A Shortcut for Zooming the Map:

There is a shortcut method for using the Magnifying Glass that works no matter which tool is currently selected. If you hold down the Option key, the mouse pointer will turn into the Magnifying Glass tool, and it will remain so until you release the Option key.

A Shortcut for Scrolling the Map:

Use the arrow keys on the keyboard to scroll the map right and left, or up and down. This only works when the map is the front window.

Choosing a Different Coordinate System for the Map:

The mouse position is normally shown in UTM-4 coordinates, but three other modes of display are available. Click on the location display to shift to UTM-8 coordinates. Click again to see the location in decimal degrees of latitude and longitude. Click yet again to see degrees-minutes-seconds. A final click returns the display to UTM-4.

1.6 Displaying Objects on the Map

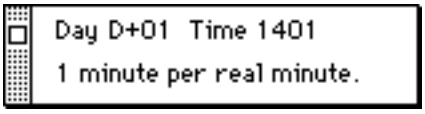
Use the Display menu (or its keyboard shortcuts) to choose whether to show or hide all of the simulated objects on the map. These are:

1. *Cities, Towns, and DP Camps:* the keyboard shortcut is ⌘**T**.
2. *Areas of Operation:* the keyboard shortcut is ⌘**A**.
3. *Units:* the keyboard shortcut is ⌘**U**.
4. *Circles of Influence for each Unit:* the keyboard shortcut is ⌘**R**.

When circles of influence are displayed, then areas of operation are not displayed, and vice versa. This eliminates the possibility of confusion between all the various colored regions on the map.

1.7 Simulation Time

DEXES is designed to run in two temporal modes: real time and accelerated time. In real time mode the simulation clock advances one simulated minute once every real minute. There is a floating window that show the current simulated day and time, and the temporal mode in which DEXES is currently operating:



Time is given in this window in the standard military 24 hour clock. The day is given in days since deployment. Thus day D+01 means the first day **after** deployment.

DEXES can run in three accelerated time speeds: one hour per tick, one day per tick, or one week per tick. The only difference between these modes is the frequency of updates to the visible charts. Only the DEXES administrator can change the temporal mode of the game.

Units and Plans

2.1 Selecting a Unit

To select a unit, click near the lower left corner of its icon with the standard selector (the black arrow mouse pointer) or the unit selector (the red arrow mouse pointer). When selected, the unit's icon will be surrounded by a rounded rectangle. An example of this may be seen in the right side of the picture below, in which a support battalion has been selected. If this unit has a plan that involves movement, as it does in this example, then the movements of the plan will also be shown when the unit is selected.

It may sometimes happen that two or more units are located near the point clicked, when you are trying to select a unit. In this case DEXES will display a popup menu that lists the names of all the units found near the point clicked, as shown in the center-left of the illustration below. This popup menu will be displayed as long as the mouse button is held down. The name of the unit that is closest to the point clicked is highlighted first. Slide the mouse up or down to select a different unit. The unit actually selected will be the unit whose name is highlighted when you release the button.

It is also possible to select all of the units near the point clicked, by choosing the first item in this popup menu.

Once a unit has been selected, you can add more units to the selection by holding down the shift key while clicking additional units. The entire selection can be cleared by clicking any point on map where no unit is located.

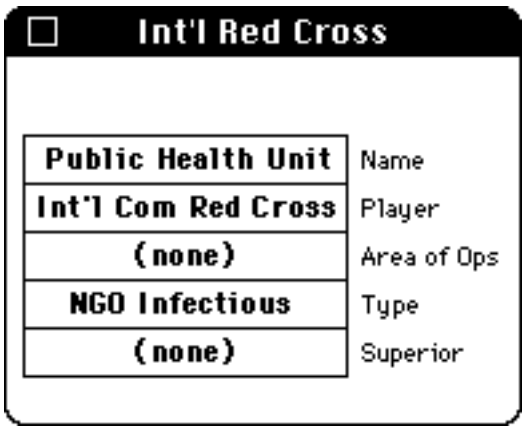
The tab key can be used to change the selection, if only one unit has been selected. Each time you press the tab key the selection will change to the next unit in the internal list of all units maintained by DEXES. There is no particular meaning to the order of this list.

It is not possible to delete or relocate a selected unit.

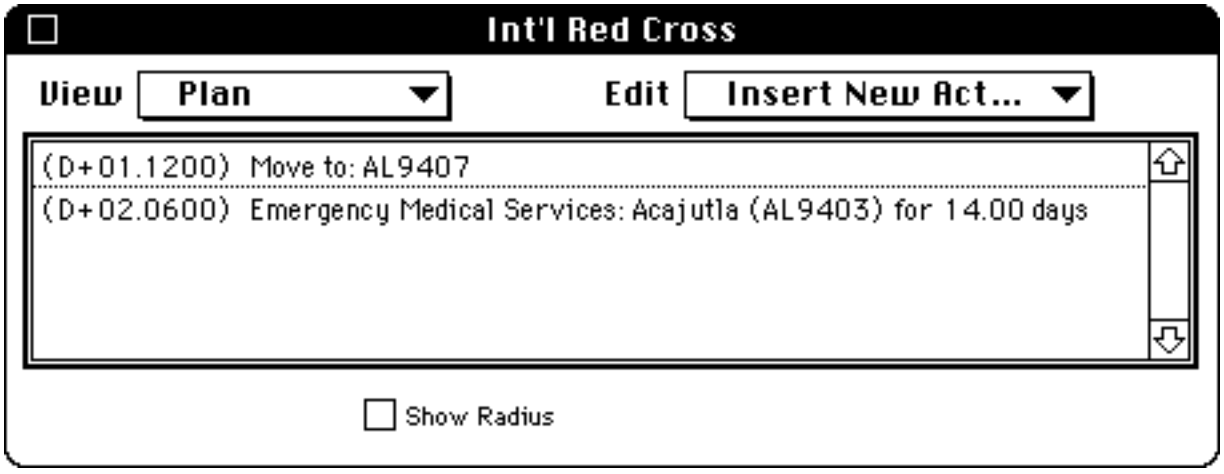
2.2 Opening a Unit

To open a unit, double-click on its position (the lower left corner of its icon). If you, as a player, do not control the unit that was selected, then this dialog appears:

In this example, the unit clicked is a Public Health Unit that belongs the the ICRC (International Committee of the Red Cross, an important NGO). The “Type” field in this dialog shows that this is an NGO Infectious Diseases Unit. Also, this unit is not assigned to any particular Area of Operations, and does not have a superior unit from which it receives command and control.



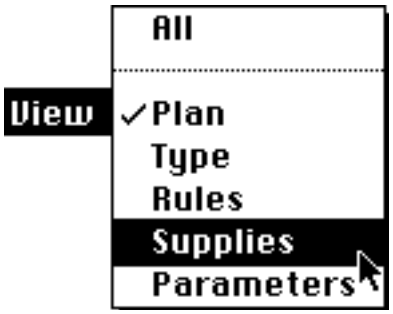
This is all the information that is available to a player who does not control the unit. However, if you, as a player, do control the unit that was double-clicked, then this dialog assumes a completely different form. The unit's plan is ordinarily shown first:



This view of the Unit dialog contains two popup menus, **View** and **Edit**, which look like this while not "popped up":

To operate a popup menu, click within its rectangle and hold down the mouse. The menu will be revealed, with the choice shown in white letters on a black background.

There are five different views of the unit that can be displayed within this dialog. Each of these views can be selected by using the **View** popup menu. The illustration on the right shows the appearance of this popup menu as the user changes from the **Plan** view to the **Supplies** view.



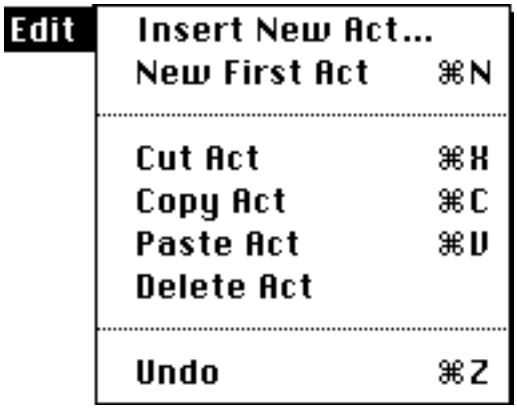
The five selectable views of this dialog are:

- **Plan** A schedule of the movements and actions in this unit's plan.
- **Type** Basic information about the type of this unit.
- **Rules** The Rules of Engagement (ROEs) that apply to this unit.
- **Supplies** The supplies currently available to this unit.
- **Parameters** This unit's characteristics, e.g. its speed, efficiency, etc.

When the user picks the view labeled **All**, then all of the above information is shown, except Rules of Engagement. Of these views, only **Type** is available to players for units that are not controlled by the player that opens the unit.

The Edit popup menu is used for editing the unit's plan of actions. To use one of these editing commands, first select an action in the plan by clicking it, then pick the desired editing command from this menu. It will be applied to the selected action.

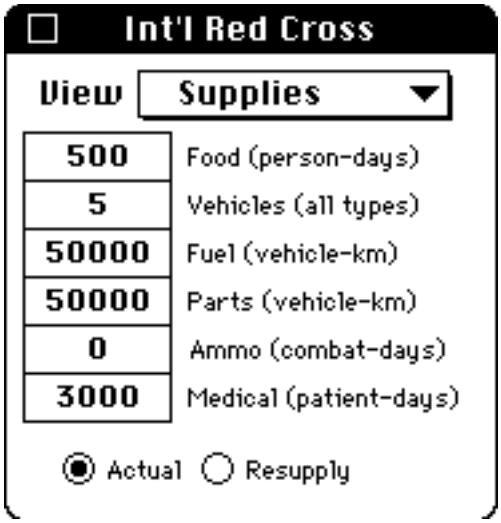
Use the first item, **Insert New Act...**, to insert a new action *after* the selected action in the plan summary. If no action is highlighted, then a new action is inserted after the last action. To insert a new action *before* the first action, use the second item, **New First Act**. The items **Cut**, **Copy**, **Paste**, and **Delete** have their usual editing meanings. An action can be copied from the plan of one unit and pasted into the plan for another.



Keyboard shortcuts for some of these commands are shown on the righthand side of the menu. For example, to copy the selected action to the clipboard, type **C** while holding down the ⌘ key on the keyboard. The **Undo** item removes the effect of the most recent editing command.

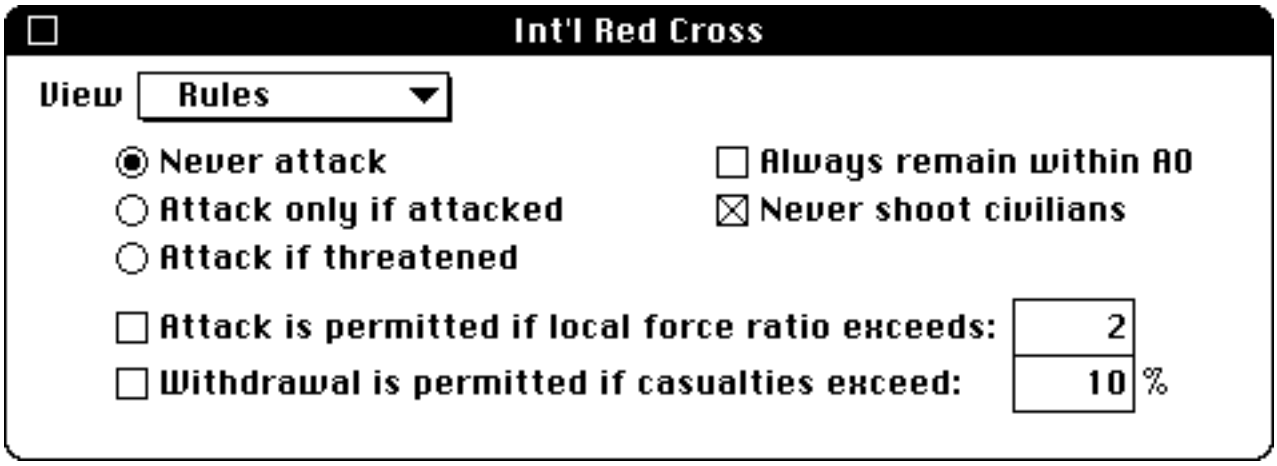
To edit an action, double-click on its summary in the Plan view. A new dialog will appear, which allows every aspect of this action to be studied and changed. This dialog will be discussed later in this section, after all the views of the unit have been covered.

The **Supply** view of the unit is similar to the illustration on the right. To see this view of the unit, select “Supplies” from the **View** popup men. This unit has a 500 person-day supply of food, which is enough to feed its 25 members for 20 days. The 50,000 vehicle-km supply of fuel and spare parts are enough to take its five vehicles 10,000 km. It has no ammunition, as befits an NGO medical unit. It has 3000 patient-days of medical supplies, which is normally sufficient for 100 acute-care patients for 30 days.

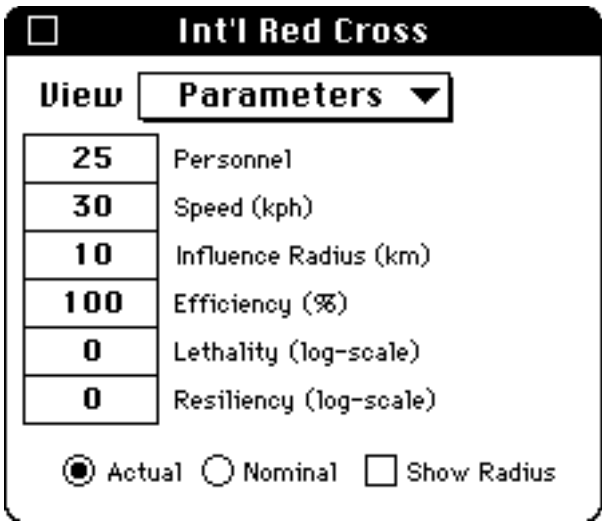


The **Supply** view also has a pair of "radio buttons." These buttons are used whenever a choice is required between mutually exclusive alternatives; in this case the alternatives are "Actual" versus "Resupply" values. The current choice, **Actual**, indicates that the supply values shown in this view are the actual current supply levels. If you click the **Resupply** radio button, then the values will change to the standard amounts that will be provided when the unit is resupplied.

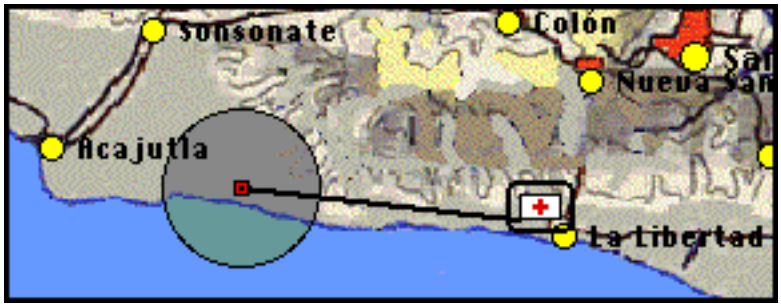
The **Rules** view shows the current Rules of Engagement under which this unit is operating. This view has a group of three radio buttons for the Attack rule. Rules that begin with an open square are called "checkboxes." Simply click in the open square to activate the rule (activated rules have an X in the square), and click again to deactivate. Two of these rules are associated with thresholds, which can be edited.



The **Parameter** view of the unit is similar to the illustration on the right. To see this view of the unit, select “Parameters” from the **View** popup men. This unit has a 25 people, and can travel at a speed of 30 kph. Its circle of influence extends 10 km from its current position, and its current efficiency is 100%. Click the **Nominal** radio button to see what these values would be if the unit were at full strength. Finally, you can click the **Show Radius** checkbox to see the unit’s circle of influence depicted on the map.



The circle of influence for unit is shown on the map as a gray shaded area, as in the following illustration for this Red Cross unit. The circle is centered over a movement node, shown in red because it is the action currently selected. When no action is selected, the circle will be centered on the current position of the unit.



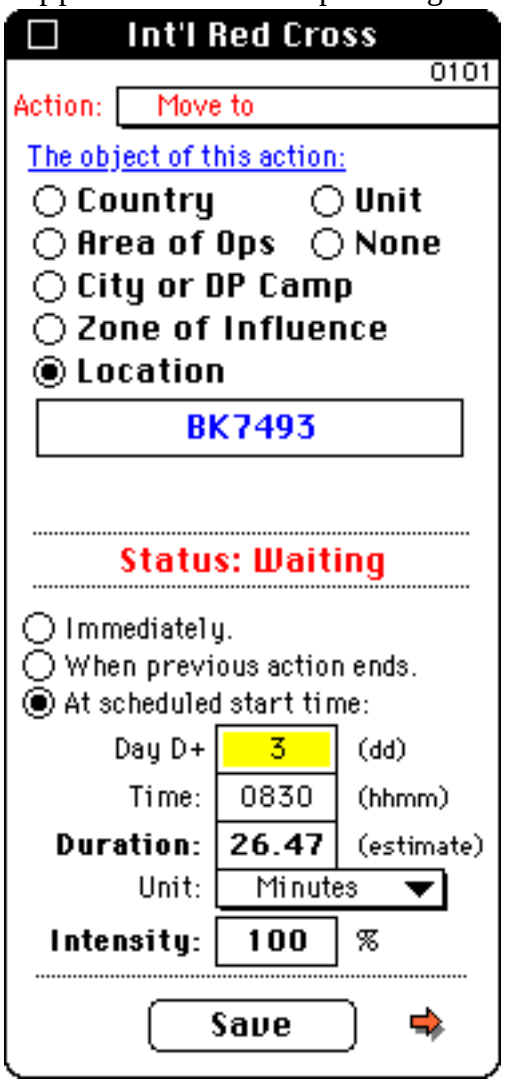
The "Lethality" and "Resilience" fields in the **Parameter** view are applicable only to military units. **Lethality** is a measure of the firepower of a unit, expressed on a logarithmic scale. An increase of one point in this scale increases by a factor of ten the rate at which the unit can kill enemy, in an engagement. Similarly, **Resilience** is a measure of a unit's ability to resist fire, also on a logarithmic scale.

When one military unit attacks another, both units suffer attrition according to the Lanchester equations, with some random fluctuations. The unit that disengages first is the unit whose casualties first reach its withdrawal threshold. Firepower, resilience, range, and threshold for withdrawal all affect the outcome. The range of a unit is given in kilometers in the "Influence Radius" field, seen above in Parameter view of the unit.

2.3 Opening an Action

When an action in the **Plan** view is double-clicked, a new dialog appears which gives the details for the selected action. The selected action itself is shown as popup menu. Click on this menu to change the action, or just to see the list of all the actions this unit can perform. The object of the action (i.e. to whom it is done) is shown as a group of seven radio buttons. To change the object, click a different button. For a city or point location, you will need to use the mouse to be more specific. First click the "Use Mouse to Select" button, then click the actual object on the map. DEXES will place its name in the square name field.

Radio buttons allow you to make an action happen immediately, or when the previous action ends, or at a scheduled time. If scheduled, enter the day and time. The duration of the event can be specified in four ways: minutes, hours, days, or "indefinite." DEXES will automatically enter its estimate of the duration when you select a movement, as happened in the example at right.



The “intensity” field is almost always important: a unit will perform each action in its plan at maximum intensity (i.e. as fast and fully as possible), unless you enter an intensity value of less than 100%. Movements, for example, will occur at the top speed of the unit unless a lower intensity is entered.

The “Save” button appears whenever you have changed an action in any way. Click this button to make the change permanent. This also has the effect of transmitting the changes to all other players. If you do not want to save the changes, then close the dialog (click in the little rectangle in its upper left corner). DEXES will ask if you really want to do this; the changes will be canceled if you then click the “Yes” button.

The little orange arrows that appear at the bottom of the dialog are buttons. Click the right arrow to see the next action in the plan; click the left arrow to see the previous action. The left arrow button is invisible above, because this is the first action.

Actions

3.0 Introduction

Actions are performed by units, according to the unit's action plan. Each unit's action plan is created by its owner (a player), using the interactive dialog described in the previous section. An action plan is simply a sequence of actions. Each action is executed at its stated time, for its stated duration. Actions may overlap (i.e. more than one action can be in progress at the same time).

A scheduled action that is within 20 seconds of starting is **locked** by DEXES, so that no-one, not even the administrator, can change the action during the last 20 seconds leading up to its execution. One minute before execution, the status line in the Action dialog will begin to flash a count-down, to warn you that the action is about to start.

Each action occurs at a scheduled time, or after the conclusion of the previous action in the plan, or "immediately." An **immediate** action will be started on the next action cycle *after the action dialog is closed.* During real time play there will be one action cycle every 15 seconds. Thus the term "immediate" really means "within 15 seconds after the Action dialog is closed."

During real time play, DEXES cycles through every unit's action plan once every 15 seconds, to see if there are any actions that need to be started or stopped. The Unit and Action dialogs of an open unit are momentarily suspended (i.e. dimmed and non-responsive) during the fraction of a second that DEXES is cycling through its plan.

Changes that you make to a unit's action plan become effective when you click the **Save** button. Even after the unit dialog is closed, you can still undo all the changes you made to a plan by choosing the **Undo** menu item in the **Edit** menu. The **Undo** item will be available only if the simulation is paused, not while it is running. To correct mistakes made during real time play, you will have to re-open the unit and make corrections to each action.

Every action is checked for conformity to the unit's **Rules of Engagement** at the time the action is defined (not performed). If the action is not in conformity, then you will be warned. However, you will not be prevented from planning actions that violate ROE's.

The Action dialog has a field labelled **Intensity**. This action parameter allows the player to specify the intensity with which the unit will undertake the action. Full intensity means that the unit uses its resources at the maximum possible rate, and achieves the maximum possible effect.

Every unit has an **Efficiency** parameter, which stands for a combination of morale, training, and readiness. When a unit's efficiency drops, its actions become less effective. In other words, the effects of actions taken by a unit are reduced by inefficiency.

Each unit checks its current **supply** parameters once every day, and requests resupply whenever any supply value drops to its resupply threshold. If a friendly supply unit is within range, and if it has the required supplies, then the unit will be resupplied.

Every unit consumes food supplies once per day, in proportion to its personnel. When a unit runs out of food, its efficiency will drop by 50% every day that it is without food. Fuel and spare parts are consumed whenever a unit is moving, if it is using its own vehicles. If a unit has no fuel or spare parts, then it can no longer move under its own power (it may still be transported by another unit, of course).

The sections that follow describe how each DEXES unit action is implemented: constraints, target types, timing, supply considerations, and effects. New actions are being implemented, so not every action in DEXES is described below.

3.1 Movements

101 Move To (any place)

The unit moves in a straight line towards its goal. During real time the unit's position is adjusted every 15 seconds. As it moves, the unit's supply of fuel and spare parts are decremented. Fuel (measured in vehicle-kilometers) is decremented by the number of vehicles in the unit times the number of kilometers travelled. Spare parts are measured and decremented similarly, but the amount of parts used is a random positive number whose average is the correct figure. The distribution of this random variable is Poisson. The unit stops moving when its fuel or parts inventory drops to zero.

The speed of movement is the intensity of the movement action times the unit's rated speed. A unit's efficiency does not affect it's speed.

102 Request Transport to (any place)

Any unit may request to be transported. If there is a transportation unit within range at the scheduled start time of this action, and if the transportation unit is capable of performing the action, then the transportation unit will convey the requesting unit towards its destination. Fuel and spare parts belonging to the transportation unit are consumed.

The overall speed of this movement is scaled by the specified intensity of the action. Neither unit's efficiency affect's the speed.

103 Patrol (area of operation)

(not yet implemented)

3.2 Peace-keeping Actions

201 Provide Security

(not yet implemented)

202 Shell Location

(to be documented)

203 Shell Unit

(to be documented)

204 Attack Unit

(to be documented)

205 Defend

(not yet implemented)

206 Disengage

(not yet implemented)

207 Observe

(to be documented)

208 Separate Combatants

(not yet implemented)

3.3 Logistics

301 Deliver Supplies

(to be documented)

302 Deliver Vehicles

(to be documented)

303 Deliver Food

(to be documented)

304 Deliver Medicine

(to be documented)

305 Deliver Water

(to be documented)

306 Deliver Fuel

(to be documented)

3.4 Repair and Construction

401 Vehicle Maintenance

(to be documented)

402 Repair Roads

This action may be applied to a city, to a region, or to the entire country.

All roads in the target area become more passable when this action is completed. The only DEXES state variable that is directly affected by this action is the population variable **Percent Without Food**,. Repairing roads allows the food distribution system to work, thus reducing the percent of the population who have no food. Indirect effects flow automatically from this reduction, as the model reacts to these changes.

403 Repair Sanitation System

This action may be applied to a city or displaced person camp.

This action reduces the size of the subpopulation at risk (for dysentery and cholera) within the target population by an amount proportional to the intensity and duration of the action, and the efficiency of the unit. Full intensity results in a reduction of 30% per day in the size of the subpopulation at risk. The “subpopulation at risk” is defined as the number of people who (a) do not now have either of these diseases, and (b) are exposed to environmental risk factors for disease transmission. Note that this action does not directly reduce the size of an ongoing epidemic; instead, it reduces the future growth of an epidemic.

404 Repair Water Supply

This action may be applied to a city or displaced person camp.

The only direct effect of this action is to reduce the **Percent Without Water** (a DEXES state variable) in the target population to zero within a single day. It does not depend on characteristics of the unit doing the action or the size of the population affected. The epidemic model automatically computes the indirect effects, such as a reduction in the size of the subpopulation at risk for waterborne diseases (cholera and dysentery, in this model).

405 Repair Power System

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to reduce the **Percent Without Power** (a DEXES state variable) in the target population to zero within a single day. It does not depend on characteristics of the unit doing the action or the size of the population affected. The economic model automatically computes the indirect effects, such as a reduction in unemployment.

406 Repair Telecom System

This action may be applied to a city, to a region, or to the entire country.

The direct effects of this action are to reduce **Unemployment** and to increase **GovernmentCompetence** (both DEXES state variables) by a small amount. It does not depend on characteristics of the unit doing the action or the size of the population affected. The societal model automatically computes a variety of indirect effects.

3.5 Police Actions

501 Regulate Traffic

(to be documented)

502 Crowd Control

(to be documented)

503 Enforce Curfew

(to be documented)

3.6 (Available Action Category)

(not yet implemented)

3.7 Guerilla Actions

701 Car Bomb

(to be documented)

702 Take Hostages

(to be documented)

703 Road Block

(to be documented)

704 Snipe at Civilians

(to be documented)

705 Assassinate Local Politician

(to be documented)

706 Threaten Reprisals

(to be documented)

707 Encourage Ethnic Hatred

(to be documented)

3.8 Psychological Operations

801 PsyOp to Increase PK Support

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to increase the **Support for PK Forces** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the median of the distribution of popular support for the peace-keeping forces increases by about 5% (within the target area). The pubic opinion model automatically computes a variety of indirect effects.

802 PsyOp to Increase Government Support

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to increase the **Support for the Government** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the median of the distribution of popular support for the host nation's government increases by about 5% (within the target area). The pubic opinion model automatically computes a variety of indirect effects.

803 PsyOp to Reduce Ethnic Tension

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to decrease the **Ethnic Distrust** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect

does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the level of ethnic distrust decreases by about 5% (within the target area). The societal model automatically computes a variety of indirect effects.

804 PsyOp to Reduce Civil Disorder

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to decrease the **Civic Unrest** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the level of civic unrest decreases by about 5% (within the target area). The societal model automatically computes a variety of indirect effects.

805 PsyOp to Reduce Black Market

This action may be applied only to the entire country.

The only direct effect of this action is to decrease the size of the **Underground Economy** (a DEXES state variable). The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the size of the underground economy is decreased by about 5%. The societal model automatically computes a variety of indirect effects.

806 PsyOp to Support Curfew

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to decrease the **Civic Unrest** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the PsyOp unit's size, because small PsyOp units can have large effects if they work through national media outlets. For each day that this action is undertaken, the level of civic unrest decreases by about 5% (within the target area). The societal model automatically computes a variety of indirect effects.

3.9 Civil Affairs

901 Assist Public Health Agencies

This action may be applied to a city, to a region, or to the entire country.

The only direct effects of this action are to decrease the population at risk for **Dysentery** and **Cholera** (DEXES state variables) within the target area. The

size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size, because small CA units can have large public health effects. For each day that this action is undertaken, the population at risk for dysentery and cholera decreases by about 5% (within the target area). The epidemic model automatically computes a variety of indirect effects.

902 Assist Agriculture

This action may be applied only to the entire country.

The only direct effect of this action is to increase **GovernmentCompetence** (a DEXES state variable). The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size, because small CA units can have huge effects if they work with national government agencies. For each day that this action is undertaken, the competence of the government increased by about 5%. The societal model automatically computes a large number of indirect effects.

903 Assist Public Safety Agencies

This action may be applied only to the entire country.

The only direct effect of this action is to increase **GovernmentCompetence** (a DEXES state variable). The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size, because small CA units can have huge effects if they work with national government agencies. For each day that this action is undertaken, the competence of the government increased by about 5%. The societal model automatically computes a large number of indirect effects.

904 Assist Judicial System

This action may be applied only to the entire country.

The only direct effect of this action is to increase **GovernmentCompetence** (a DEXES state variable). The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size, because small CA units can have huge effects if they work with national government agencies. For each day that this action is undertaken, the competence of the government increased by about 5%. The societal model automatically computes a large number of indirect effects.

905 Mediate Civil-Military Dispute

This action may be applied to a city, to a region, or to the entire country.

The only direct effect of this action is to increase the **Support for PK Forces** (a DEXES state variable) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size, because a small CA units can have mediate a large dispute. For each day that this action is undertaken, the median of the distribution of popular support for the peace-keeping forces increases by about 5% (within the target area). The pubic opinion model automatically computes a variety of indirect effects.

906 Hire Local Labor

This action may be applied to a city, to a region, or to the entire country.

The direct effects of this action are to decrease **Unemployment**, and to increase the **Support for PK Forces** (both DEXES state variables) within the target area. The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size. For each day that this action is undertaken, the median of the distribution of popular support for the peace-keeping forces increases by about 5% (within the target area). The pubic opinion model automatically computes a variety of indirect effects. Unemployment is increased a small amount.

907 Assist Industry

This action may be applied only to the entire country.

The only direct effect of this action is to increase **Economic Growth Rate** (a DEXES state variable). The size of the effect is scaled by the intensity of the action, and by the unit's efficiency. The size of the effect does not depend on the CA unit's size. For each month that this action is undertaken, the economic growth rate increases by about 1%. The economic model automatically computes several indirect effects.

3.9 Humanitarian Actions

1001 Emergency Food and Water Distribution

This action may be applied to a city, to a region, or to the entire country.

If the unit has food and water supplies in excess of what it needs for one week of operation, then it disperses its excess to the population who have no food or water. The variables **Percent Without Food** and **Percent Without Water** in the target area decline based on the amount of food and water actually distributed.

1002 Distribute Food and Water

This action may be applied to a city, to a region, or to the entire country.

The action *temporarily* reduces the size of the population with no food and water. This action does nothing to fix the normal food and water supply system of the target area.

1003 Vaccinate Civilians

This action may be applied to a city, to a region, or to the entire country.

The action reduces the size of the population at risk for cholera, but not for dysentery. It does not reduce the number already sick.

1004 Enforce Quarantine

This action may be applied to a city, to a region, or to the entire country.

The action reduces the size of the population at risk for cholera and dysentery by a very small amount. It does not reduce the number already sick.

1005 Relocate Displaced Persons

This action may be applied to a city, to a region, or to the entire country.

The population who are currently displaced in the target area are gradually relocated into resident status.

1006 Evacuate Civilians

(not yet implemented — this will be part of the NEO module for DEXES)

1007 Bury Victims

(to be documented)

1008 Treat Catastrophe Victims

(to be documented)

Public Health

4.1 Epidemics

The DEXES epidemic model depends upon four variables: the number of people in each city and region that (a) are displaced from their homes, (b) are without access to clean water, (c) have dysentery, and (d) have cholera. The epidemic model calculates the number of new cases of dysentery and cholera each day, based on the number of people currently infected and the size of the population at risk. The key to the epidemic model is the size of the population at risk — this is the single most important factor for controlling and ultimately conquering a threatened epidemic. When the population at risk can be be reduced to near zero, whether by vaccination, quarantine, repair of sanitation systems, or the emergency supply of clean water, the epidemic will burn itself out.

In general, DEXES estimates the size of the population at risk for dysentery and cholera as the larger of these two quantities:

- (those without access to clean water) – (those already sick),
- (50% of displaced persons) + (10% of residents) – (those already sick).

The primary strategy for overcoming an epidemic is to restore access to clean water and to relocate displaced persons. Vaccination is not effective for dysentery, because a vaccine does not exist. There is a vaccine for cholera, which further reduces the population at risk.

4.2 Water

Each town, city, DP camp, or rural district in DEXES has a certain amount of stored clean water. When emergency water is supplied to one of these target areas, its stored water increases. This is very different from repairing its water supply. The latter action has the effect of reducing the number without access to clean water to zero. In contrast, the former action temporarily removes the target area from the risk of infection with water-borne diseases, until the water is consumed. If no further water is provided, the entire population is immediately at risk for infection.

In the DEXES model, no deaths are directly attributable to lack of water (or food or power, for that matter). However, deaths from disease are concentrated primarily among those who lack water or food, and (to a much lesser extent) power.